Shallow Groundwater & Drinking Water Wells

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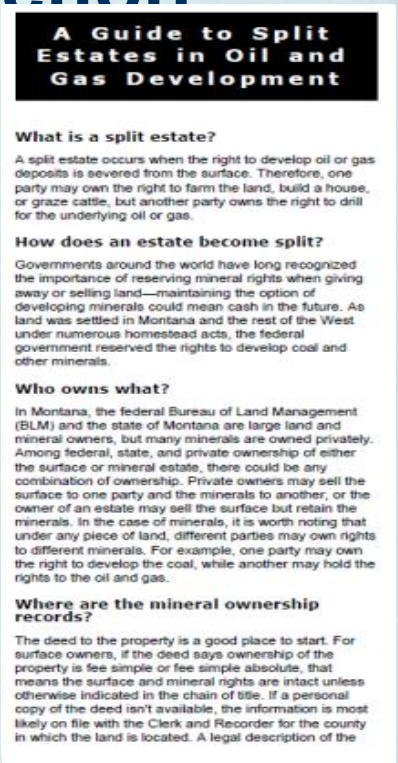
- Acronyms (DEQ, DNRC, BOG)
- Introduction
- Typical Water Well Construction
- Well Problems
- Well Log
- Water Right
- Monitoring



A Guide to Split Estates in Oil and Gas Development

What is a split estate?

A split estate occurs when the right to develop oil or gas deposits is severed from the surface. Therefore, one party may own the right to farm the land, build a house, or graze cattle, but another party owns the right to drill for the underlying oil or gas.

How does an estate become split?

Governments around the world have long recognized the importance of reserving mineral rights when giving away or selling land—maintaining the option of developing minerals could mean cash in the future. As land was settled in Montana and the rest of the West under numerous homestead acts, the federal government reserved the rights to develop coal and other minerals.

Who owns what?

In Montana, the federal Bureau of Land Management (BLM) and the state of Montana are large land and mineral owners, but many minerals are owned privately. Among federal, state, and private ownership of either the surface or mineral estate, there could be any combination of ownership. Private owners may sell the surface to one party and the minerals to another, or the owner of an estate may sell the surface but retain the minerals. In the case of minerals, it is worth noting that under any piece of land, different parties may own rights to different minerals. For example, one party may own the right to develop the coal, while another may hold the rights to the oil and gas.

Where are the mineral ownership records?

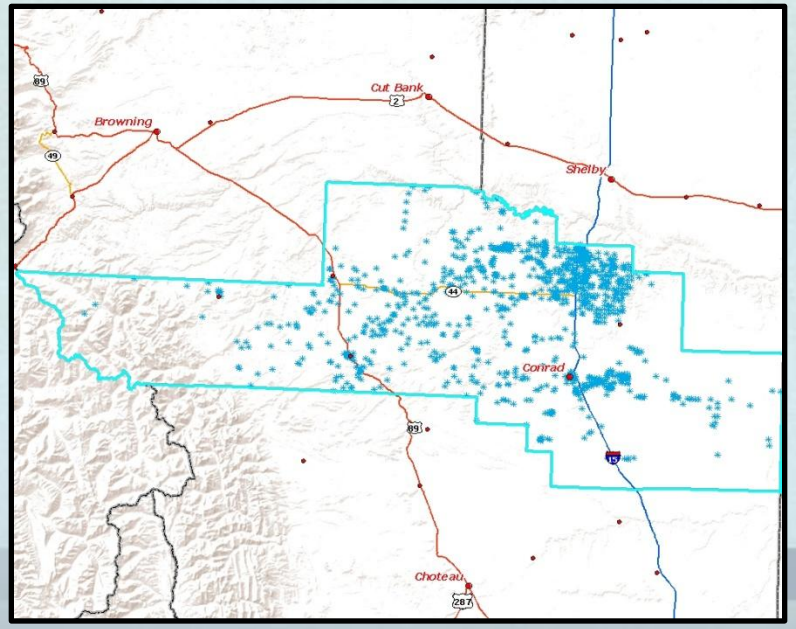
The deed to the property is a good place to start. For surface owners, if the deed says ownership of the property is fee simple or fee simple absolute, that means the surface and mineral rights are intact unless otherwise indicated in the chain of title. If a personal copy of the deed isn't available, the information is most likely on file with the Clerk and Recorder for the county in which the land is located. A legal description of the

- Elevated nitrate
- Elevated uranium
- Prescription drugs, bug repellant
- Mineralized
- Low yield
- Adjacent closed landfill w/solvent plume

But we use it ‘cause it is what we have.

Pondera County Water Well Data

- 350 domestic wells
- 24 Public water supply wells
- 25 irrigation wells
- 170 stock wells

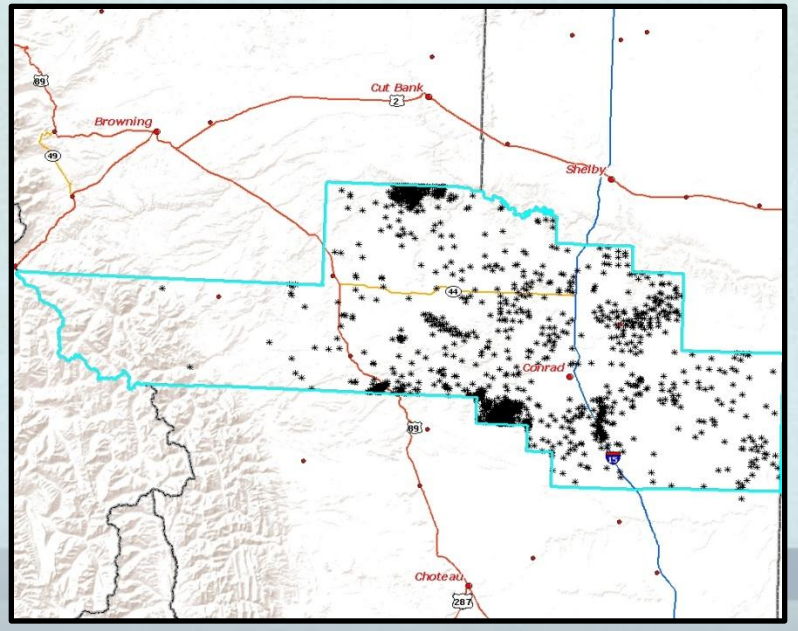


Average 97 feet

total depth

Pondera County Oil/Gas Well Data

- 1483 wells recorded (oldest recorded is 1923)
  - 30% dry holes
  - 8% injection wells (disposal)
  - 60% are oil/gas wells

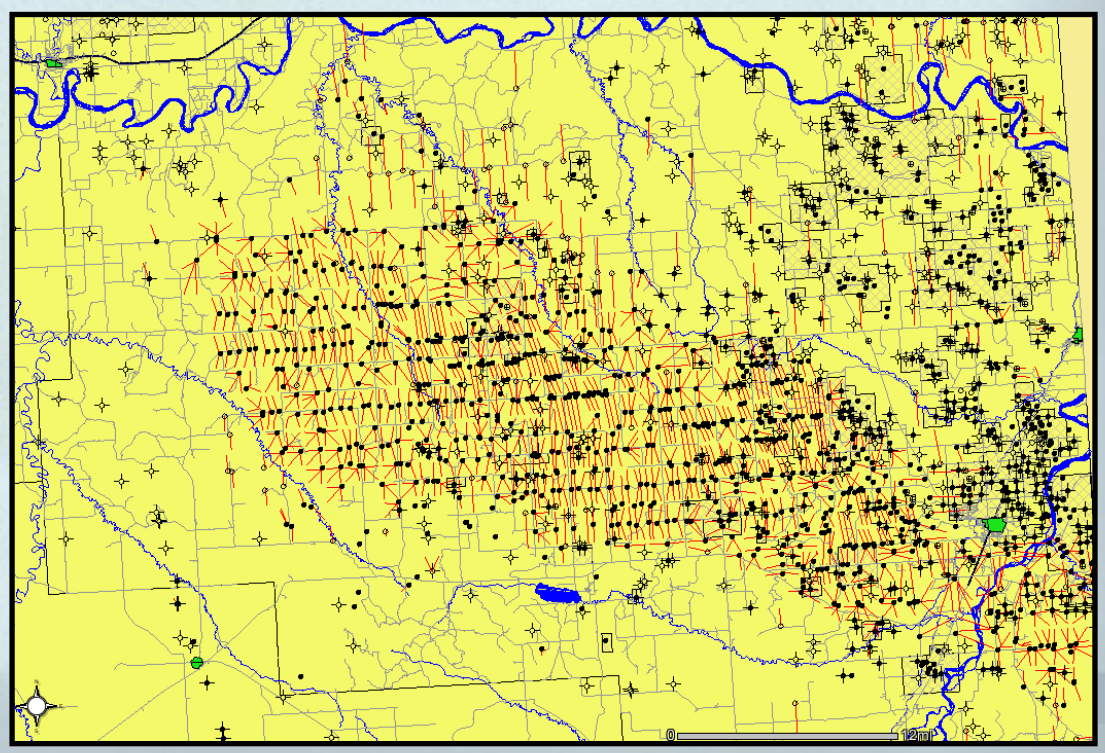


average 2,250 feet

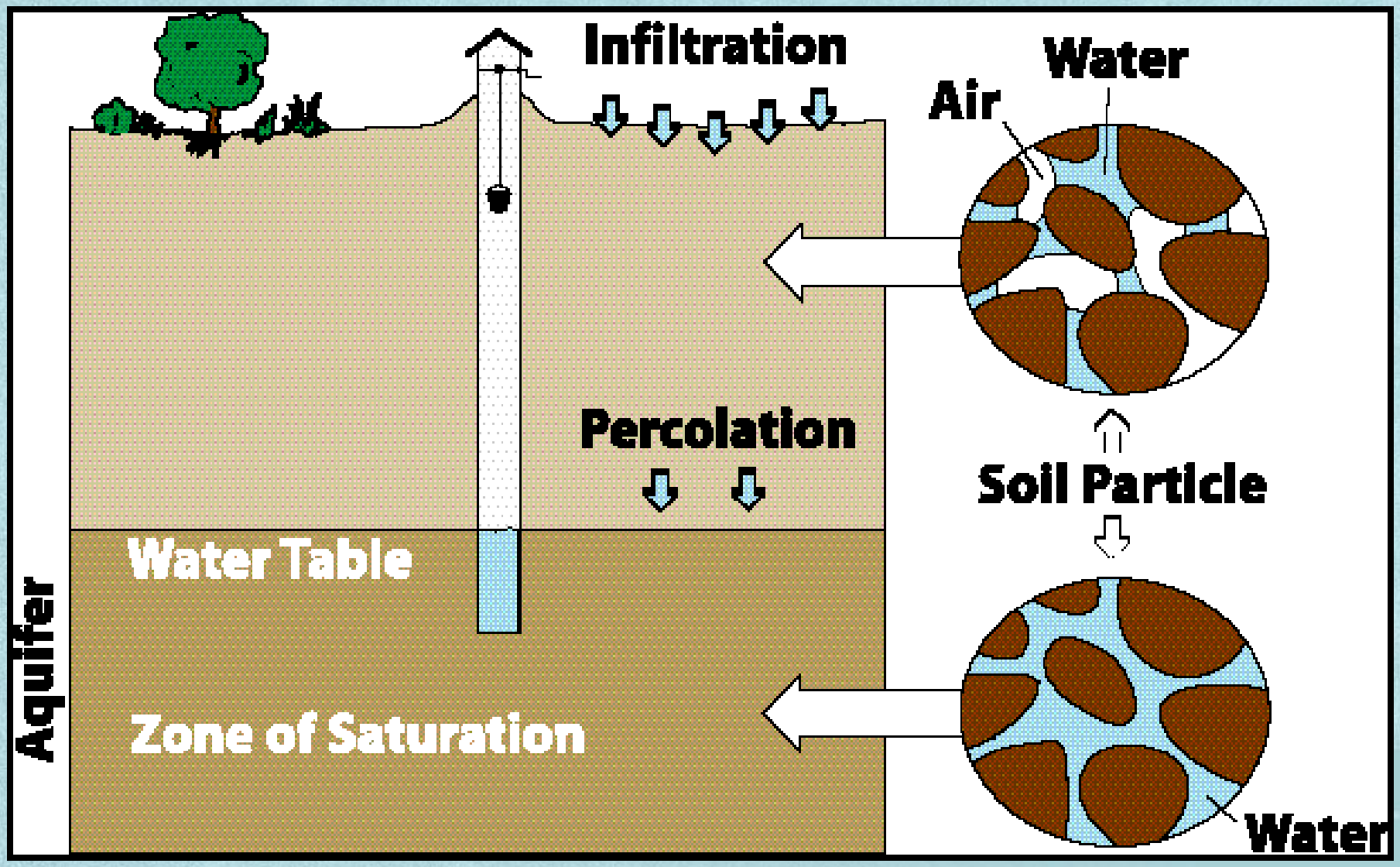
total depth

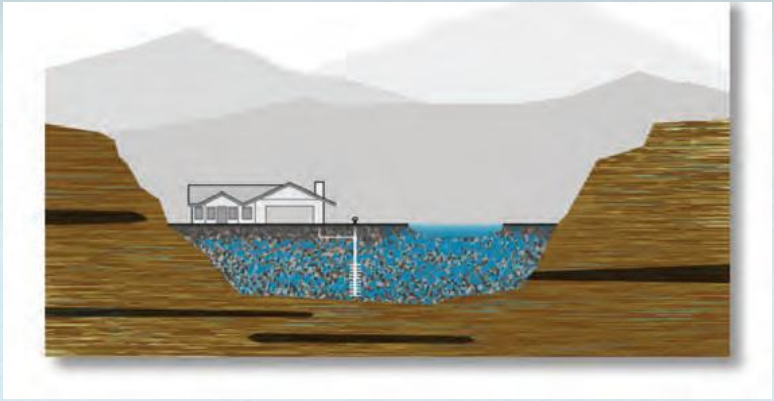
Richland County Oil/Gas Well Data

- 1,900 wells recorded
- Note horizontal well paths

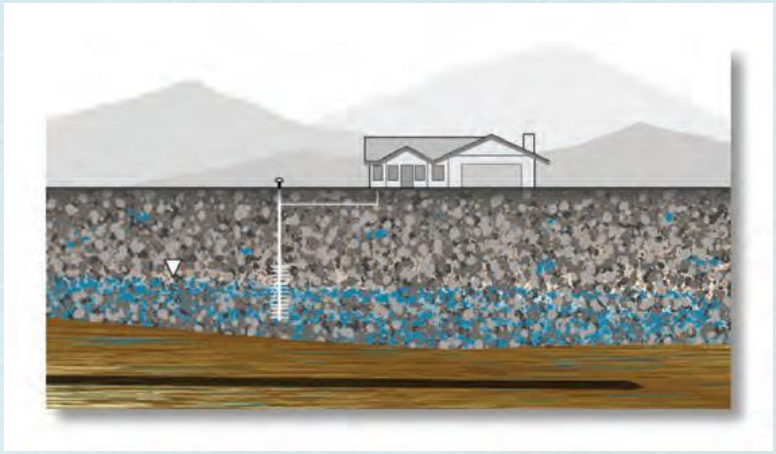


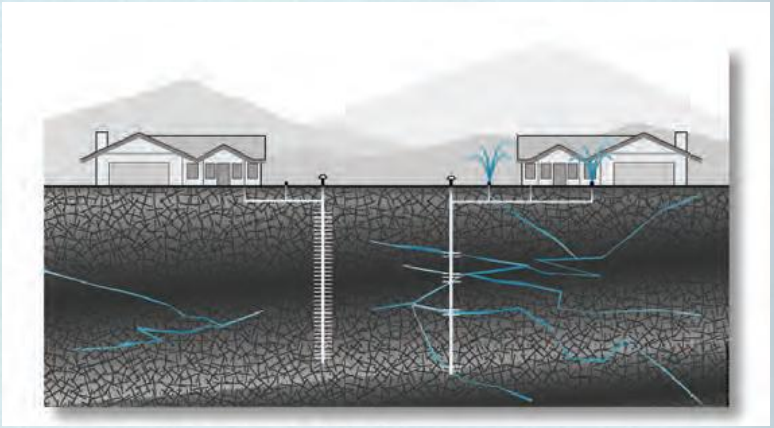
What is a Water Well? Aquifer?

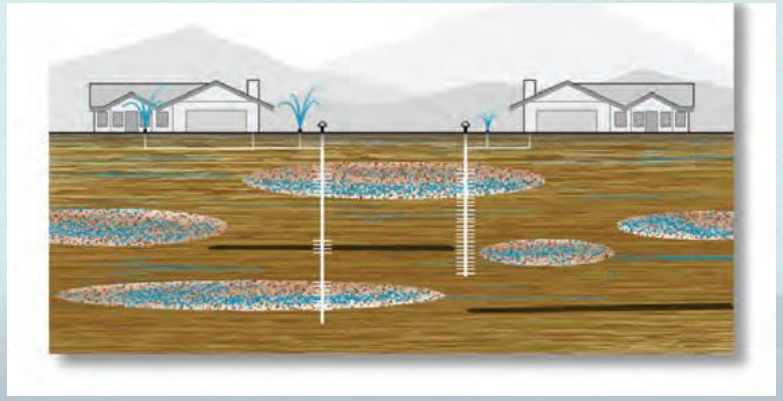




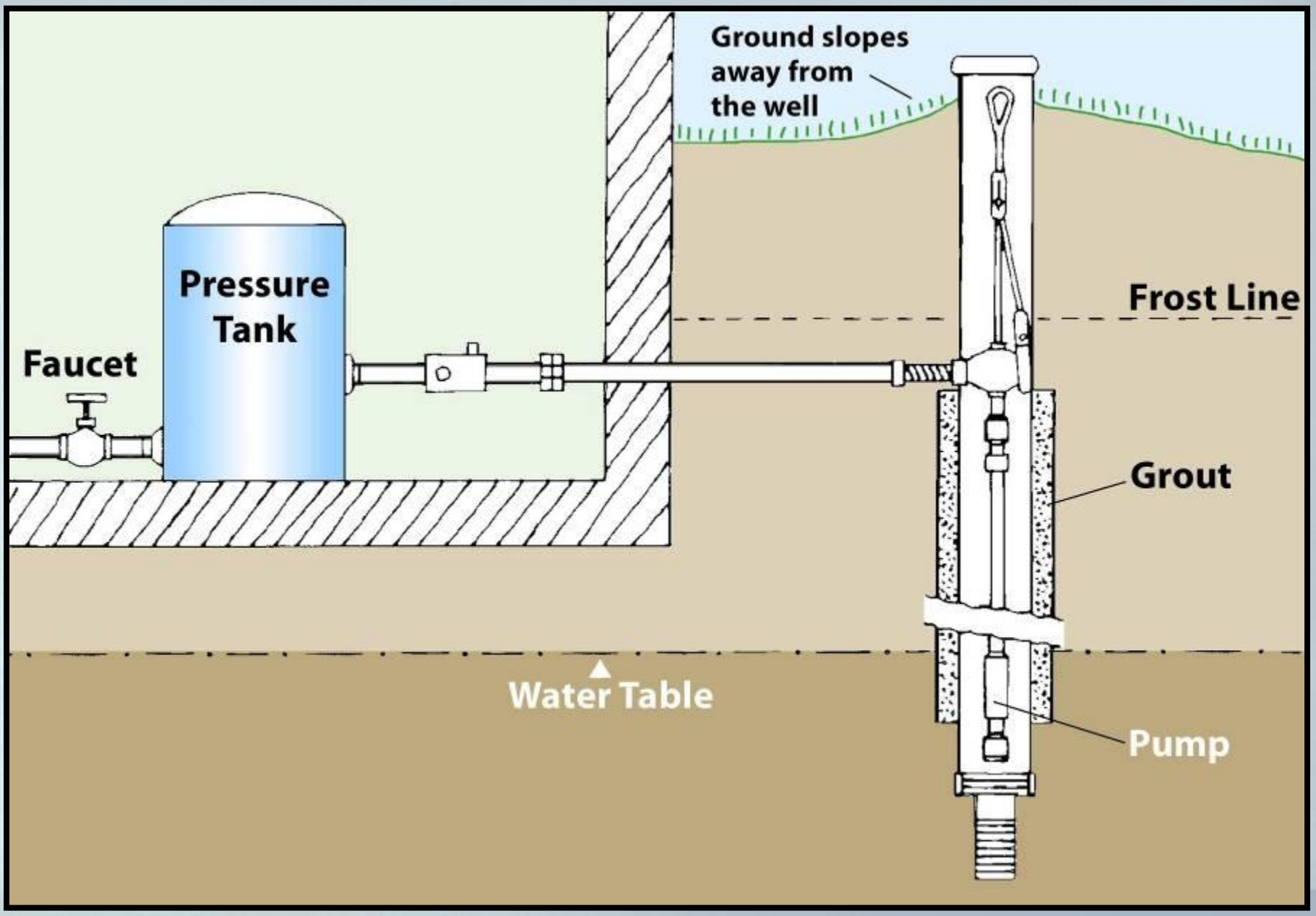
Typical East Slope
Aquifer Settings

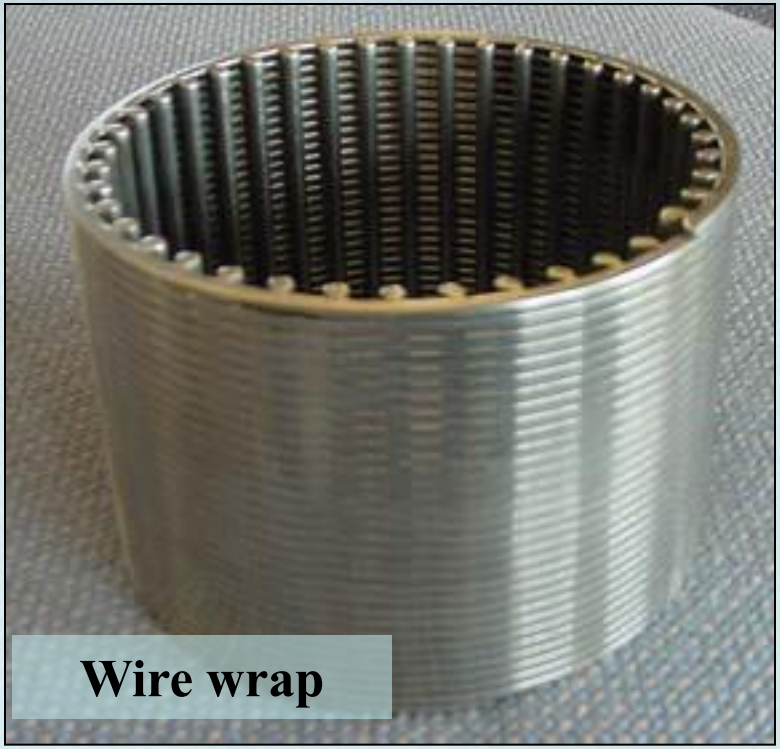






Drinking Water Well Construction


Ground slopes
away from
the well
Pressure
Tank
Faucet
Frost Line
Grout
Water Table
Pump



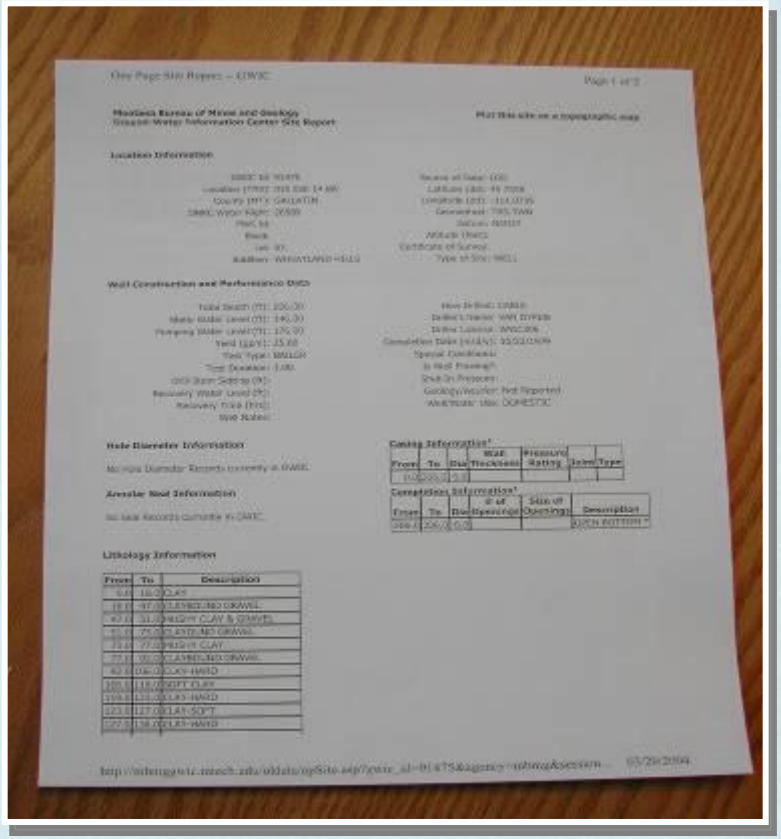
Common types of well screens/perforations

Sanitary seal well cap

Split cap

Well Cap

The Well Log



- Location
- Construction detail
- Tested flow rate
- Static water level
- Geology encountered

Log is filed with GWIC (Ground Water Information Center-MBMG)

Finding a Well Log

- Go on-line to http://mbmggwic.mtech.edu/
- Contact local DNRC office
- Contact Joe Meek at DEQ at (406) 444-4806

Note: identifying your well log can be a challenge; have as much info. available as possible such as:

  - original owner name & well location
  - approximate date completed
  - approximate depth

Water Rights

Water Rights

A well log is not a water right. Do you have "**standing**"?

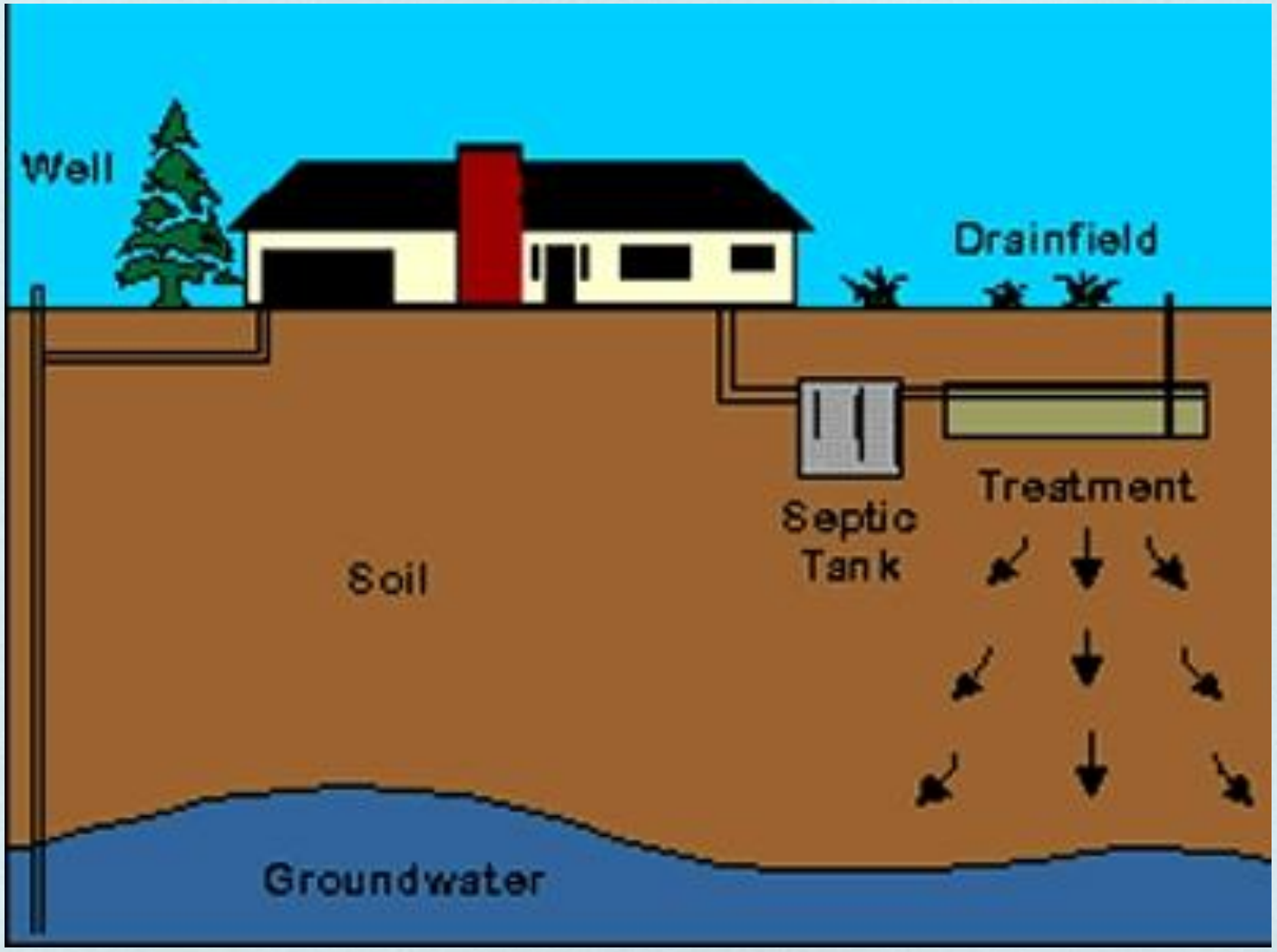
- For 35 gpm or less….***Notice of Appropriation*** is filed (after well is put to use).
  - –Secures your legal right to the water

- For more than 35 gpm ….apply for a water right (before well is constructed).

Well Problems

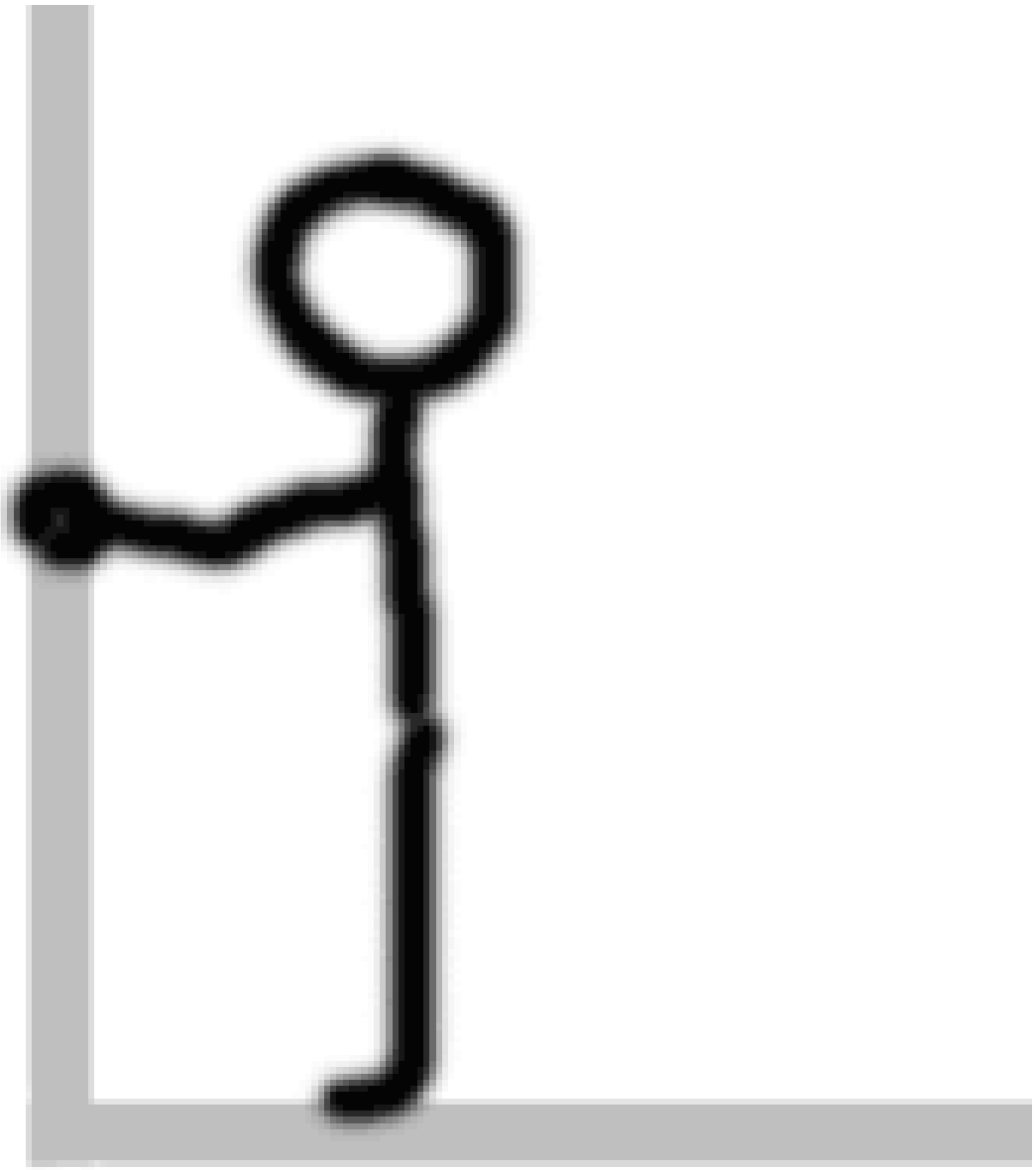

Water well
Overflowing stock tank

Septic Systems Recharge Aquifers



Domestic Well Considerations

- Hazards come from all land uses
- Pay attention to apparent leaks, spills, or dumping
- Contact regulatory authority if needed
- The greatest hazards to water quality are usually those closest to the wellhead
- If concerned, consider monitoring before drilling, after, and annually
- For defensible data, have samples collected by a professional. Protocols are critical.
- See handout for suggested analyte list
- If possible, negotiate monitoring into surface agreement



Analyte List

- pH: Acid/base measurement. Relatively constant

- Specific Conductance: how easily water conducts an electrical current.

- BTEX: benzene, toluene, ethylbenzene, and xylene are found in petroleum products

- Major Ions: dissolved elements, relatively constant.

- Metals: found naturally, relatively constant.

- Total dissolved solids: similar to conductance

Analyte List

- Oil and Grease: May use as a trigger for follow up DRO/GRO analysis.

- Dissolved Methane: may be in shallow or deep formations, may be "naturally" present in shallow water

- Diesel Range Organics (DRO) and Gas Range Organics (GRO):


Oil & Grease
EXPRESS MAIL
www.thermosafe.com
VOLATILE ORGANIC COMPOUNDS

Surface Use Agreements

Chemical Disclosure - Well Map - Windows Internet Explorer provided by MT DEQ

http://www.hydraulicfracturingdisclosure.org/fracfocusfind/

File Edit View Favorites Tools Help

Favorites | Home | FracFocus Chemical ... | Chemical Disclosure - Wel... | Page | Safety | Tools

Find a Well

Map Search | Standard Search

STATE: Montana

COUNTY: Glacier

WELLS IN COUNTY: Choose a County First

OPERATOR: Choose One

API WELL NUMBER: __-___-____

WELL NAME:

Search | Reset | Not Seeing Map Markers? Please Click The "Reset" Button (left).

All FracFocus well site information is voluntarily provided by participating oil and natural gas operators. Wells hydraulically fractured after January 1, 2011 will be added to the database over time.

See the full list of participating production companies.

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Hydraulic Fracturing Fluid Product Component Information Disclosure

Fracture Date	10/16/2011
State:	Montana
County:	Glacier
API Number:	25-035-22183
Operator Name:	Rosetta Resources
Well Name and Number:	Fee Simonson 3608-34-01H
Longitude:	-112.627207713
Latitude:	48.8407290067
Long/Lat Projection:	WGS84
Production Type:	Oil
True Vertical Depth (TVD):	
Total Water Volume (gal)*:	

Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
			Water (Including Mix Water Supplied by Rosetta)*	-		86.09814%	
	Schlumberger		Crystalline silica	14808-60-7		13.08369%	
	Schlumberger		Hydrochloric acid	7647-01-0		0.27135%	
	Schlumberger		Guar gum	9000-30-0		0.23138%	
	Schlumberger		Potassium borate	1332-77-0		0.07580%	
	Schlumberger		M th lMethanol	67 56 167-56-1		0.07409%	
	Schlumberger		Formic acid	64-18-6		0.03541%	
	Schlumberger		Glycerol	56-81-5		0.02472%	
	Schlumberger		Potassium hydroxide	1310-58-3		0.02472%	
	Schlumberger		Diammonium peroxidisulphate	7727-54-0		0.02351%	
	Schlumberger		Alcohol, C11 linear, ethoxylated	34398-01-1		0.01253%	
	Schlumberger		Tetrasodium ethylenediaminetetraacetate	64-02-8		0.01238%	
	Schlumberger		Alcohol, C9-C11, Ethoxylated	68439-46-3		0.00835%	
	Schlumberger		Ethoxylated branched C7-9, C8-rich alcohols	78330-19-5		0.00788%	
	Schlumberger		Ethoxylated branched C9-11, C10-rich alcohols	78330-20-8		0.00788%	
	Schlumberger		Ethoxylated propoxylated 4-nonylphenol-formaldehyde resin	30846-35-6		0.00583%	
	Schlumberger		Glutaraldehyde	111-30-8		0.00481%	
	Schlumberger		Heavy aromatic naphtha	64742-94-5		0.00394%	
	Schlumberger		Alkylbenzyldimethylammonium chlorides, benzyl-C10-16-alkyldimethyl	68989-00-4		0.00394%	
	Schlumberger		Alcohols, C11-14-isoalcs., C13-rich, ethoxylated	78330-21-9		0.00394%	
	Schlumberger		Fatty acids, tall-oil	61790-12-3		0.00375%	
	Schlumberger		Tar bases, quinoline derivs., benzyl	72480-70-7		0.00309%	

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Web links & Contacts

http://bogc.dnrc.mt.gov/staff.asp
MT BOG staff contacts
http://www.mtrules.org/gateway/ChapterHome.asp?Chapter=36%2E22
MT BOG Rules
http://fracfocus.org/
Frac Focus
http://GWPC.org
Ground Water Protection Council
http://NGWA.org
National Ground Water Association
http://bogc.dnrc.mt.gov/web_mapper.asp
MT BOG On-line Mapper

Oil/Gas site development or drilling issues- call Gary Klotz, Field Supervisor, Board of Oil/Gas (406) 434-2422
Water/Air/Solid Waste issues- call local health department or
Chad Anderson, Enforcement, Dept of Environmental Quality (406)444-2964

END

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